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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/824,994

04/15/2004

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A2242-US-DIV

7265

33726 7590 05/01/2007
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EXAMINER

NGUYEN, LAM S

ART UNIT

PAPER NUMBER

2853

MAIL DATE

DELIVERY MODE

05/01/2007

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/824,994

Applicant(s)

READY ET AL

Examiner

LAM S. NGUYEN

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 08 January 2007.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 10-20 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 10-20 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 15 April 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--------------------------------------------------------------------------------------|-------------------------------------------------------------------|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Applicant's arguments, see Appeal Brief, filed 01/08/2007, with respect to the rejection(s) of claim 10 have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of newly cited prior art Kubo et al. (US 2001/0019340 A1).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

1. Claims 10-11 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fujimoto et al. (US 6390597) in view of Kubo et al. (US 2001/0019340 A1).

Referring to claim 10:

Fujimoto et al. discloses a printing system comprising:

a stage (*FIG. 12, element 72*) for supporting a substrate (*FIG. 12, element S*);

a print head (*FIG. 11, element 300*) including:

an ejector base (*FIG. 3, element 10*), and

a plurality of ejectors (*FIG. 3, elements 25a-d*) mounted in the ejector base

(*FIG. 3, element 10*);

means for moving the print head in a first print direction and a second print direction across a substrate without changing a rotational orientation of the print head relative to the substrate, the first print direction and the second print direction being nonparallel (*FIG. 11*:

The printhead (300) moves in the MAIN SCANNING DIRECTION (first direction) and relatively moves in the SUB SCANNING DIRECTION (second direction), wherein the main scanning direction and the sub-scanning direction are nonparallel); and

means for causing the plurality ejectors to selectively eject material toward the substrate when the print head is moving in the first printing direction (*column 7, line 60 to column 8, line 1: In accordance to printing data, the driver applies a drive voltage to a specified (selected) piezoelectric element to cause ink ejected via a corresponding nozzle to perform printing while the printhead 300 moves in the main scanning direction),*

wherein the first plurality of ejectors are arranged on the ejector base in a first line, the first line being diagonal to the first print direction and the second print direction (*FIG. 2: The plurality of ejectors (101) are arranged along a line that is diagonal respect to either the main scanning direction (first direction) or the sub-scanning direction (second direction). FIG. 5A: The first plurality of ejector is 16d, for example).*

Fujimoto et al., however, does not disclose wherein said means for causing the plurality ejectors causes the plurality ejectors to selectively eject material toward the substrate when the print head is moving in the second direction.

Kubo et al. discloses an inkjet printer including an inkjet head (FIG. 1, element 151) configured to move in both X and Y scanning directions and comprising a plurality of ejectors (nozzles) (FIG. 3A, element 152) selectively discharging color inks during the movement of the inkjet printhead in the X and Y scanning directions (first and second directions) (FIG. 1).

Therefore, it would have been obvious for one having ordinary skill in the art at the time invention was made to modify Fujimoto et al.'s means for causing the plurality of ejectors

discharging ink in both main scanning (first) and sub-scanning (second) directions as disclosed by Kubo et al. The motivation for doing so would have been to be able to form images on the whole surface of the substrate (109) as taught by Kubo et al. (*FIG. 1*).

- **Fujimoto et al. also discloses the following claimed invention:**

Referring to claim 11: wherein the first print direction and the second print direction are orthogonal (*FIG. 1-2: The main scanning direction (first direction) and the sub-scanning direction (second direction) are orthogonal*).

Referring to claim 15: further comprising a second plurality of ejectors (*FIG. 5A: The second plurality of ejector is 16c, for example*) mounted in the ejector base (*FIG. 5A*), the second plurality of ejectors being arranged in a second line, the second line being parallel to the first line (*FIG. 5A: The nozzle array lines 16c-d are parallel*), wherein each of the first plurality of ejectors and the second plurality of ejectors has a unique position in the first print direction (*FIG. 5A: Each ejector/nozzle in each nozzle array prints an unique position in the main scanning direction (first direction)*).

2. Claims 10, 13, and 15-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Katagami et al. (US 2002/0105688 A1) in view of Kubo et al. (US 2001/0019340 A1).

Referring to claim 10:

Katagami et al. discloses a printing system comprising:

a stage (*FIG. 9, element 49*) for supporting a substrate (*FIG. 9, element 12*);

a print head (*FIG. 9, element 22*) including:

an ejector base (*FIG. 4, element 25*), and

a plurality of ejectors (*FIG. 4, elements 28*) mounted in the ejector base

(FIG. 4, element 25);

means for moving the print head in a first print direction and a second print direction across a substrate without changing a rotational orientation of the print head relative to the substrate, the first print direction and the second print direction being nonparallel (FIG. 9: *The printhead (22) moves in the X direction (first direction) and relatively moves in the Y direction (second direction), wherein the X and Y directions are nonparallel*); and

means for causing the plurality ejectors to selectively eject material toward the substrate when the print head is moving in the first printing direction (*paragraph [0012]: "Selectively discharge ink from each of nozzles 304 during each time of main scanning", wherein the main scanning is the first direction*), wherein the first plurality of ejectors are arranged on the ejector base in a first line, the first line being diagonal to the first print direction and the second print direction (FIG. 1: *The plurality of ejectors (27) are arranged in the leftmost array (20) along a line that is diagonal respect to either the X direction (first direction) or the Y direction (second direction)*)).

Katagami et al., however, does not disclose wherein said means for causing the plurality ejectors causes the plurality ejectors to selectively eject material toward the substrate when the print head is moving in the second direction.

Kubo et al. discloses an inkjet printer including an inkjet head (FIG. 1, element 151) configured to move in both X and Y scanning directions and comprising a plurality of ejectors (nozzles) (FIG. 3A, element 152) selectively discharging color inks toward a substrate (109) during the movement of the inkjet printhead in the X and Y scanning directions (first and second directions) (FIG. 1).

Therefore, it would have been obvious for one having ordinary skill in the art at the time invention was made to modify Katagami et al.'s means for causing the plurality of ejectors discharging ink in both main scanning (first) and sub-scanning (second) directions as disclosed by Kubo et al. The motivation for doing so would have been to be able to form images on the whole surface of the substrate (109) as taught by Kubo et al. (*FIG. 1*).

- **Katagami et al. also discloses the following claimed invention:**

Referring to claim 13: further comprising means for causing the print head to print an IC pattern (*FIG. 1, element 11*) on the substrate (*FIG. 1, element 12*), wherein a first spacing between each of the first plurality of ejectors in the first print direction is an integer multiple of a first design rule of the IC pattern (*Paragraph [0052] teaches the nozzle (ejector) pitch of the nozzles belonging to each head is coincided with the element pitch formed on the substrate. As shown in FIG. 1, the spacing between two adjacent ejectors 27 in the X direction equals to the spacing between two adjacent printed elements 7 in the X direction (the first design rule). In this case the integer multiple value is one*), and wherein a second spacing between each of the first plurality of ejectors in the second print direction is an integer multiple of a second design rule of the IC pattern (*Paragraph [0052] teaches the nozzle (ejector) pitch of the nozzles belonging to each head is coincided with the element pitch formed on the substrate. As shown in FIG. 1, the spacing between two adjacent ejectors 27 in the Y direction equals to the spacing between two adjacent printed elements 7 in the Y direction (the second design rule). In this case the integer multiple value is one*).

Referring to claim 15: further comprising a second plurality of ejectors (*FIG. 1: The ejectors 27 in the second leftmost array 20*) mounted in the ejector base (*FIG. 1, element 25*), the

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second plurality of ejectors being arranged in a second line, the second line being parallel to the first line (*FIG. 1: The leftmost array and the second leftmost array are parallel*), wherein each of the first plurality of ejectors and the second plurality of ejectors has a unique position in the first print direction (*FIG. 1: Each ejector 27 in the leftmost array and the second leftmost array prints an unique position in the X direction*).

Referring to claim 16: further comprising a third plurality of ejectors mounted in the ejector base, the third plurality of ejectors being arranged in a third line, the third line being parallel to the first line (*FIG. 1: The third leftmost ejector array 20*), wherein each of the first plurality of ejectors and the third plurality of ejectors has a unique position in the second print direction (*FIG. 1: Each ejector 27 in the leftmost array 20 and the third leftmost array (20) prints an unique position on the Y direction per a main scanning. After a main scanning completes, the substrate is relatively moved in the Y direction (sub-scanning) with an amount corresponding to the total length of the six nozzle rows 28, and the arrays print other unique positions respect to the Y direction*).

Referring to claims 17-18: further comprising means for causing the plurality of ejectors to print a phase change material for a semiconductor process mask or a solution-processable electronic materials to form an integrated circuit (*paragraph [0216-0217]: Dielectric material or a semiconductor material can be discharged from the printhead to form various semiconductor devices*). (*In addition, because the applicant admits that “Depending on the type and intended use of the printed pattern being formed, the printing fluid can comprise a variety of material, including phase-change materials such as wax or photoresist (to form semiconductor process masks), and colloidal suspensions such as solution-processable electronic (i.e., conducting ,*

semiconducting, or dielectric) materials, and organic or inorganic materials (e.g., to form IC features)” (specification, paragraph [0038]), the claim elements do not carry patentability weight).

Referring to claims 19-20: further comprising means for aligning the plurality of ejectors to the substrate before causing the plurality of ejectors to selectively eject said material toward the substrate, wherein said means for aligning comprises a camera mounted on said means for moving (*FIG. 9, element 81 and paragraph [0125]: The head camera observes the board (substrate) 12 for the purpose of aligning/positioning the printhead to the drawing start position*).

3. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Fujimoto et al. (US 6390597) in view of Kubo et al. (US 2001/0019340 A1) as applied to claim 11, and further in view of Minowa et al. (US 5936648).

Fujimoto et al., as modified, discloses the claimed invention as discussed above except wherein the first line is at a 45-degree angle with respect to the first print direction and the second print direction.

Minowa et al. discloses a printing apparatus having a printhead (*FIG. 5, element 30*) including a nozzle array (*FIG. 5, element 31-1 to 31-n*) that is sloped at 45 degrees respect to the first print direction (the main scanning direction or the traveling direction of the printhead) (*column 7, lines 39-45*) and the second print direction (*as shown in FIG. 2, the second print direction is the advance direction of the printing medium P on the platen (52), which is orthogonal to the travel direction of the printhead (30) across the printing medium P*).

Therefore, it would have been obvious for one having ordinary skill in the art at the time invention was made to modify the inclination angle of the ejector array in the printhead disclosed by Fujimoto et al., as modified, to be at 45 degrees respect to the first and second print directions as disclosed by Minowa et al.

The motivation for doing so would have been to reduce the distance between adjacent pixels printed on the recording medium in order to improve resolution as taught by Minowa et al. (*column 7, lines 46-53*).

4. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Katagami et al. (US 2002/0105688 A1) in view of Kubo et al. (US 2001/0019340 A1) as applied to claim 13, and further in view of a legal precedent (*MPEP 2144.04 LEGAL PRECEDENT AS SOURCE OF SUPPORTING RATIONALE*).

Katagami et al., as modified, discloses the claimed invention as discussed in the second rejection and also teaches that the inclination angle θ of the first ejector line is adjustable from 0 to 90 degrees respect to the first and second print direction (X and Y directions) (*FIG. 1*).

Katagami et al., as modified, however does not specifically teach wherein the first design rule is the same as the second design rule.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to adjust the inclination angle θ of the first line being at 45 degrees respect to the first and second print direction to obtain the first spacing of the plurality of ejectors in the first print direction being the same as the second spacing of ejectors in the second print direction, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch*, 617 F. 2d 272, 205 USPQ 215 (CCPA 1980). In this

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case, the equality of the first spacing and the second spacing would result of forming an IC pattern having the first design rule being the same as the second design rule.

Response to Arguments

Applicant's arguments with respect to claim 10 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to LAM S. NGUYEN whose telephone number is (571)272-2151. The examiner can normally be reached on 7:00AM - 3:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, STEPHEN D. MEIER can be reached on (571)272-2149. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.



LAM SON NGUYEN